

*Conservation Assessment*  
*for the*  
*Whiteleaf Mountainmint*  
*(Pycnanthemum albescens Torr. & A.Gray)*



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*Pycnanthemum albescens* Torr. & A.Gray, from the PLANTS Database, U.S.D.A.,  
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This Conservation Assessment was prepared to compile the published and unpublished information on the subject taxon or community; or this document was prepared by another organization and provides information to serve as a Conservation Assessment for the Eastern Region of the Forest Service. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject taxon, please contact the Eastern Region of the Forest Service - Threatened and Endangered Species Program at 310 Wisconsin Avenue, Suite 580 Milwaukee, Wisconsin 53203.

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## EXECUTIVE SUMMARY

This Conservation Assessment is a review of the taxonomy, distribution, habitat, ecology, and status of the Whiteleaf Mountainmint, *Pycnanthemum albescens* Torr. & A.Gray, throughout the United States and in the U.S.D.A. Forest Service lands, Eastern Region (Region 9), in particular. This document also serves to update knowledge about the potential threats, and conservation efforts regarding the Whiteleaf Mountainmint to date. The Whiteleaf Mountainmint is a very fragrant perennial herb normally found in drier uplands, and it has short-pubescent whitish bracts, with multiple few-branched 4-angled [square] hollow stems. The species is known only from the United States, it has a somewhat scattered distribution in the southeastern, central, and plains states, and it is known historically from thirteen states, from Illinois, Kentucky and North Carolina south and west to Florida, Texas and Kansas. It has declined in recent decades. Globally, its ranking is G5 (secure world-wide); its National status in the United States is NNR (it has not been ranked nationally). It is most common in Arkansas, Louisiana, Missouri, and Mississippi. The Whiteleaf Mountainmint is listed as Endangered in two states, Illinois and Kentucky. The species is known from historic records only in Kansas, and it has been listed as a plant of Special Concern in Georgia. In Forest Service Region 9, the Whiteleaf Mountainmint is included on the Regional Forester Sensitive Species list (RFSS) for the Shawnee National Forest but not the Hoosier National Forest where it has not been found. It is at risk at the margins of its range.

In addition to species listed as endangered or threatened under the Endangered Species Act (ESA), or species of Concern by U.S. Fish and Wildlife Service, the Forest Service lists species that are Sensitive within each region (RFSS). The National Forest Management Act and U.S. Forest Service policy require that National Forest System land be managed to maintain viable populations of all native plant and animal species. A viable population is one that has the estimated numbers and distribution of reproductive individuals to ensure the continued existence of the entity throughout its range within a given planning area.

The objectives of this document are to:

- Provide an overview of the current scientific knowledge on the species.
- Provide a summary of the distribution and status on the species range-wide and within the Eastern Region of the Forest Service, in particular.
- Provide the available background information needed to prepare a subsequent Conservation Approach.

## NOMENCLATURE AND TAXONOMY

Scientific Name: *Pycnanthemum albescens* Torr. & A.Gray [1841]

Common Names: Whiteleaf Mountainmint; White-leaved Mountain-mint; White-leaf Mountain-mint; Whiteleaf Mountain Mint; White Mountain Mint; Mountain Mint

Synonymy: *Pycnanthemum incanum* (L.) Michx. var. *albescens* (Torr. & A.Gray) Chapm. [1860]

*Koellia albescens* (Torr. & A.Gray ex A.Gray) Kuntze [1891]

*Koellia pauciflora* Small [1933]

Class: Magnoliopsida (Flowering Plants - Dicotyledons)

Family: Lamiaceae (= Labiatae; the Mint Family)

Plants Code: PYAL (USDA NRCS plant database, [W-1](#))

<http://plants.usda.gov/>

The mint genus *Pycnanthemum* contains approximately 17 - 20 species, depending on its interpretation, all of which grow only in North America (Chambers 1961; Mabberley 1987). Most of the species grow in the eastern United States, with the center of diversity for the genus located in the mountains of North Carolina (Chambers 1961). The species appear to be most common in open forests and prairies, both wet and dry, as well as on barrens and other open rock habitats. As the common name Mountainmint implies, this mint genus is often associated with upland or mountain habitats, but not at extremely high elevations.

The Whiteleaf Mountainmint was first named by John Torrey and Asa Gray in one of a series of articles on new American plants by Asa Gray in 1841. Otto Kuntze resurrected the obscure generic name *Koellia* Moench [1794] in 1891 and he and others subsequently transferred most of the species of *Pycnanthemum* into it, but this was not been accepted by most botanists. In fact, the later genus *Pycnanthemum* Michaux [1803] has been formally conserved according to the International Code of Botanical Nomenclature (Greuter *et al.* 2000) with *Pycnanthemum incanum* (L.) Michx. as its type. *Pycnanthemum albescens* has been long recognized as being very similar to *Pycnanthemum incanum*, and the American botanist Alvan Wentworth Chapman renamed it as a variety of that species in 1860. The genus is generally included within the subfamily Nepetoideae, tribe Mentheae, placing it very close to the more widely-known and used genus *Mentha*, the true mints. The generic name was derived from the Greek *pycnos*, dense, and *anthon*, flower, so named because of the compact inflorescences of small flowers. The specific epithet *albescens* derives from the Latin word meaning 'becoming white' or whitish (Fernald 1950) based on the fact that the upper leaves, or bracts, are strongly whitened at maturity.

Radford *et al.* (1964) include *Pycnanthemum albescens* Torr. & A.Gray as a synonym of their accepted species *P. incanum* (L.) Michx., and they also include with it *P. incanum* var.

*loomisii* (Nutt.) Fern., *P. pycnanthemoides* (Leavenw.) Fern., and additional varieties. They state: “A quite variable species, particularly as to pubescence” (p. 919). While the similarity of the two species is evident, *Pycnanthemum albescens* is accepted as distinct by nearly all current botanists.

Evidence suggests that *Pycnanthemum albescens* is most closely related to *Pycnanthemum loomisii* (= *Pycnanthemum incanum* var. *loomisii*). A natural hybrid between *Pycnanthemum albescens* and *Pycnanthemum loomisii* (= *Pycnanthemum incanum* var. *loomisii*) has been described from Florida (Chambers and Chambers 1971). Hybrids have also been produced by crossing *P. albescens* with *P. incanum* and with *P. pycnanthemoides* (Chambers and Chambers 1971). The hybrids between *P. albescens* and *P. loomisii* were fully fertile and produced normal pollen. The hybrids between *P. albescens* and *P. pycnanthemoides* and between *P. albescens* and *P. incanum* produced no pollen and were small and withered. It should also be noted that, according to Chambers and Chambers (1971), within *P. albescens* there are two distinct chromosome conditions, a diploid ( $2n = 38$ , in the Gulf coast states) and a tetraploid ( $2n = 76$ , in Arkansas and Oklahoma).

## DESCRIPTION OF SPECIES

*Pycnanthemum albescens*, the Whiteleaf Mountainmint, is a rhizomatous erect perennial herb generally 1 – 1.5 meters tall from fibrous roots (it also roots at the lowest stem nodes), with multiple few-branched 4-angled [square] hollow stems that are pubescent with both long and short hairs; the upper internodes are puberulent or minutely incurved-pilose and may or may not have additional spreading hairs; the entire plant has a strong sharp minty aroma; the **leaves** are 3-7 (-9) cm long x 1-2.5 (-4) cm wide, simple, opposite, decussate, and short petiolate, with petioles to 6 mm long and pubescent like the stem; the blades are punctate and minutely pubescent (more densely so beneath), the shape is lanceolate to ovate, the margins are remotely serrulate with usually 1-10 small teeth on each side, and, except for the lower ones, they are strongly whitened (the lower blades are green above and whitish-green beneath); the **inflorescence** is composed of several relatively small axillary and lateral capitate clusters of bracteate cymes; the inflorescence branches are clearly visible and not hidden by the flowers; the pedicels are about 1 mm long; the bracts subtending the inflorescences have a strongly whitened covering; each division of the cyme has a gradually reduced bract beneath it; the **flower** calyx is 5-lobed, 4 mm long, weakly two-lipped, glandular punctate, the tube is glabrous within, and it is covered outside by a dense whitish pubescence that lacks long multicellular trichomes; the **calyx** upper lip is 2-lobed, each lobe is bluntly acute (deltoid), lacks a bristle, and is up to 1 mm long, the lower lip is 1-1.3 mm long, shallowly 3-lobed or notched at the apex, and the lobes are pubescent internally; the white (occasionally pink-tinted in age) **corolla** is two-lipped and 6 mm long, the corolla tube is glabrous on the outside and pubescent within; the corolla upper lip is 3-lobed and 4-5 mm wide; the lobes are deflexed and spotted with purple inside, the central lobe is bent forward at the tip and the lateral lobes are shorter than the central lobe; there are 4

subequal exserted stamens fused to the apex of the corolla tube and alternating with the lobes; filaments are 4-5 mm long, white, and glabrous; anthers are 0.8 mm long and orange; the style is white, 7-8 mm long, glabrous and exserted; the stigma is unequally 2-lobed; the ovary is 4-lobed and green, 0.5 mm long, and each lobe is pubescent on the top; the **fruit** is composed of 4 tiny nutlets. The plants normally flower from July - September, and the fruits can be mature from August to October, or sometimes later. The chromosome number is  $2n = 38$ ,  $2n = 76$ . (Adapted primarily from Fernald 1950, Steyermark 1963, Gleason and Cronquist 1991).

The Whiteleaf Mountainmint can be recognized by its conspicuously whitish bracts and upper leaves and it has the characteristic sharp mint aroma of the genus. It can be distinguished from most other familiar species of *Pycnanthemum* (e.g., *P. pilosum*, *P. tenuifolium*, *P. verticillatum*, *P. virginianum*) first by its two-lipped (bilabiate) calyx, a feature, however, shared by several other related species. Among the closely related species, *Pycnanthemum pycnanthemoides* differs from *P. albescens* by its shaggy-hairy (villous or hirsute) stems and petioles as well as its deep pink to purple flowers, and *P. montanum* differs by its very dense, nearly spherical sessile cream-color flower clusters (the branches not visible) found in the axils of upper green, not whitened, leaves.

The species is most similar to *Pycnanthemum loomisii* as well as to *P. incanum*, and it can be confused with both species as well as the varieties *P. incanum* var. *incanum* and var. *puberulum*. The basic difference between *Pycnanthemum albescens* and both *P. loomisii* and *P. incanum* and its varieties is its wider, blunter calyx lobes that lack bristles (these are more narrowed and bristle-tipped in *P. incanum* and *P. loomisii*). Table 1 below presents the differences among these taxa. This series of differences is derived primarily from Fernald (1950) who spent considerable time working with this group. Nevertheless, there can still be some difficulty in distinguishing these taxa. All of the taxa except for *P. incanum* var. *puberulum* have been reported within southern Illinois.

Table 1. Distinguishing features within the *Pycnanthemum incanum* – *P. albescens* group (after Fernald 1950 and Gleason and Cronquist 1991).

Taxon	Calyx teeth	Bract and calyx pubescence	Stem and leaf pubescence
<i>P. albescens</i> [Range: se. MO and s. IL to FL & TX]	Calyx teeth ovate, deltoid, or oblong, obtuse [blunt]; not bristle-tipped. The lower ca. 1 mm long, upper distinctly shorter.	Inner bracts and calyx-teeth without subterminal slender trichomes; calyx densely canescent-pannose, without long multicellular trichomes	Upper internodes of stem puberulent or minutely incurved-pilose, with or without spreading hairs; leaves lanceolate to ovate, all but the lower strongly whitened, pale and minutely pubescent beneath
<i>P. incanum</i> var. <i>incanum</i> [Range: VT & NY to s. OH, s IL, GA, NC, TN]	Calyx teeth deltoid, obtuse or acute to acuminate, the lower < ½ as long as tube, slender tipped, not bristle-tipped. The lower 1-1.5 mm long, the upper 0.5-1 mm.	Inner bracts and calyx-teeth usually with (infrequently without) subterminal slender trichomes; calyx closely canescent; inner bracts and lance-acuminate slender-tipped teeth with or without long flexuous subterminal trichomes	Upper internodes of stem cinereous-pilose with curving crowded hairs mixed with some longer straight divergent ones; leaves ovate to ovate-oblong, hoary pilose beneath with copious elongate hairs



<i>P. incanum</i> var. <i>puberulum</i> [Range: VA, WV, OH to LA, FL]	Calyx teeth acuminate to attenuate, slender (bristle) tipped	Inner bracts and calyx-teeth with or without subterminal slender trichomes; calyx sparsely pubescent, not densely canescent	Upper internodes of stem sparse and very minute to almost lacking; leaves ovate-lanceolate to broadly lanceolate, minutely pilose to pruinose beneath; [??] summits of bracts and calyx-teeth with long divergent multicellular trichomes.
<i>P. loomisii</i> (Gleason and Cronquist 1991) = <i>P. incanum</i> var. <i>loomisii</i> (Fernald 1950). [Range: VA to s. IL and n. FL]	Calyx teeth acuminate to attenuate, the lower > ½ as long as tube, slender (bristle) tipped; lower teeth 1-2 mm long, usually longer than the upper.	Inner bracts and calyx-teeth with subterminal slender trichomes; calyx densely canescent; summits of bracts and calyx-teeth with long divergent multicellular trichomes.	Upper internodes of stem densely canescent with minute incurved hairs without or with few longer spreading ones; leaves ovate-lanceolate to broadly lanceolate, minutely pilose or pruinose beneath

## HABITAT AND ECOLOGY

The Whiteleaf Mountainmint has been given a national wetland indicator status of UPL or FAC, indicating that the species normally does not occur in wetlands, but in some areas, it is equally likely to occur in wetlands as not [UPL = Obligate Upland, occurs almost always (estimated probability 99%) in non-wetlands; FAC = Facultative, the species is equally likely to occur in wetlands or non-wetlands (estimated probability 34% - 66%)]. In Region 3, including both Illinois and Indiana, *Pycnanthemum albescens* has been specifically designated as a UPL species (Reed 1988; W-1; W-2), indicating that it is almost never found in wetlands in this area. Overall, these habitats include dry upland forests as well as low open woods often along streams. It is relatively rare in the northern portions of its range, and it appears to prefer, and is most common in, the more moderate to warm climates of the central and southern states.

A review of the literature demonstrates that this herb has a variety of plant associates and habitats throughout its range. *Pycnanthemum albescens* grows mainly in open dry woods (dry-mesic upland forests) though it can also be found on more level and moist sites as well, especially in the southern portion of its range. Floras have listed the habitat of *Pycnanthemum albescens* as "Dry woods and thickets" (Fernald 1950), "Dry upland woods" (Gleason and Cronquist 1991), "cherty slopes" (Mohlenbrock 2002), "rocky open woods, grassy slopes, and clearings" (Steyermark 1963), "Pine flatwoods and savannas, hillside bogs in pinelands; low open woodlands, thickets bordering swamps, swales; also in open, upland woodlands" in the southeastern United States (Godfrey and Wooten 1981), "Bluffs, secondary woods, margins of creeks and cypress swamps" in the Florida panhandle (Clewett 1985), and in "low open woods, often along streams, in savannahs and in thicket areas" in eastern Texas (Correll and Johnston 1970). Records indicate that it is most frequently found at elevations from 100 – 950 feet.

The soils where it grows are normally acidic, and Steyermark (1963) states that these acidic soils overlie chert, sandstone and granite substrates. Data indicate that the soils where the species grows often measure between pH 5.2 and 6, but it appears to be comfortable in circumneutral soils of pH 6.85 as well (Fontenot 2001). Among the soil types in which it occurs in Louisiana are sandy clay-loam and silty clay. The species does not appear to have a very strong pH

preference, but it prefers a rich loamy soil in full sun or partial shade with plenty of moisture in the growing season. It frequently grows over cherty outcrops in shallow soil, but not always.

At the northeastern limit of its range, in Illinois, *Pycnanthemum albescens* grows on cherty limestone slopes in dry, open upland forests, and it has been found only in Union County (Mohlenbrock 1986, 2002; Herkert and Ebinger 2002; Shawnee National Forest 2005). It is restricted to the Southern Section of the Ozark Natural Division of Illinois (Schwegman *et al.* 1973; Herkert and Ebinger 2002). It was last seen in Illinois in 1977, and no extant sites are known, but much suitable habitat still exists (Shawnee National Forest 2005). This species has not been found in Indiana.

In Missouri, *Pycnanthemum albescens* is far more common and better-known than in Illinois (Steyermark 1963). In that state it is a conspicuous plant of dry, rocky, acid upland forests in the Ozark Mountains in the southern ¼ of the state. Typically, it is in oak-hickory forests and mixed hardwood – pine forests dominated by the **trees** *Carya glabra*, *Carya ovata*, *Carya texana*, *Juglans cinerea* [declining now], *Juniperus virginiana*, *Liquidambar styraciflua*, *Ostrya virginiana*, *Pinus echinata* [locally], *Quercus marilandica*, *Quercus muhlenbergii*, *Quercus rubra*, *Quercus stellata*, and *Quercus velutina*, and *Ulmus alata*, expected **shrub** associates include *Cornus drummondii*, *Rhus copallinum*, and *Vaccinium* spp., the **vines** *Campsis radicans*, *Celastrus scandens*, and *Parthenocissus quinquefolia*, the **forbs** *Coreopsis tinctoria*, *Erysimum capitatum*, *Heuchera americana*, *Sedum pulchellum*, *Solidago drummondii*, and *Solidago ulmifolia*, and the **graminoids** *Andropogon gerardii*, *Bouteloua curtipendula*, *Danthonia spicata*, *Muhlenbergia sobolifera*, *Panicum virgatum*, *Schizachyrium scoparium*, and *Sporobolus junceus*. It has also been found in thickets and cutover forests with *Rhus*, *Rubus* and grasses.

In Louisiana and Texas, *Pycnanthemum albescens* grows in several rather variable habitats, including the longleaf pine – blackjack oak – switchgrass woodland (an open, savanna-like woodland), dry-xeric woodlands, mixed hardwood – loblolly pine forests, cutover pine hills, black calcareous prairie, and disturbed fields bordering forests (W-3; NatureServe 2004). All of these habitats are subject to fire and burning, and associated species with this mint often include the **trees** *Carya texana*, *Liquidambar styraciflua*, *Ostrya virginiana*, *Pinus palustris*, *Pinus taeda*, *Quercus marilandica*, and *Quercus stellata*, the **shrubs** *Callicarpa americana*, *Ilex vomitoria*, *Myrica cerifera*, *Rhus copallinum*, *Vaccinium arboreum*, and *Vaccinium stamineum*, the **vine** *Gelsemium sempervirens*, the **forbs** *Asclepias verticillata*, *Aster dumosus*, *Chamaecrista fasciculata*, *Croton capitatus*, *Eryngium yuccifolium*, *Eupatorium hyssopifolium*, *Helianthus angustifolius*, *Liatris acidota*, *Liatris elegans*, *Liatris pycnostachya*, *Solidago* spp., *Stylosanthes biflora*, and *Tephrosia onobrychoides*, and the **graminoids** *Andropogon* spp., *Chasmanthium sessiliflorum*, *Dichantherium*, *Juncus* spp., *Panicum anceps*, *Panicum virgatum*, *Paspalum floridanum*, *Paspalum setaceum*, *Schizachyrium scoparium*, and *Sporobolus junceus* (data from specimens in LSU herbarium – W-4). *Pycnanthemum albescens* is also an occasional component

in some hillside seepage bogs in these two states.

## DISTRIBUTION AND ABUNDANCE

*Pycnanthemum albescens*, the Whiteleaf Mountainmint, is restricted to the south-central and south-eastern portion of the eastern United States and it is known to occur historically in twelve (or thirteen) states, namely, Alabama, Arkansas, Florida, Georgia, Illinois, Kansas, Kentucky, Louisiana, Mississippi, Missouri, North Carolina (?), Oklahoma, and Texas (W-1, W-3).

*Pycnanthemum albescens* is relatively rare in the northeastern portion of its range, and it becomes more common in a few southern states (W-1, W-3). Its range includes only unglaciated areas. The distribution of this mint has decreased in recent decades. It is considered to be 'historic only' in Kansas, and no longer occurs in that state (W-1, W-3; Kartesz and Meacham 1999). It has been reported in North Carolina, but that remains questionable, and it remains unranked in that state. It probably does not occur in North Carolina, and any previous reports were probably based upon a different taxon, likely *Pycnanthemum incanum*, with which it was combined by Radford *et al.* (1964). Likewise, reports from adjacent Virginia and South Carolina can be referred to *Pycnanthemum incanum* or another closely related species. As with most other species, it becomes scarce at the margins of its range. Its historic range assessed on a county basis also was greater than its current range. One can generally expect that a decline has occurred in recent decades because of the general loss and degradation of its natural habitats nationally.

In areas where *Pycnanthemum albescens* overlaps in range with *P. incanum*, *P. loomisii*, *P. pycnanthemoides*, and its other close relatives, hybrids can occur and it can be difficult to identify specimens with certainty in those areas. This is why Radford *et al.* (1964) and some others chose to lump them all into *P. incanum* in that region. This situation also occurs in southern Illinois and in other areas of species overlap.

The frequency of the Whiteleaf Mountainmint cannot be estimated based upon its state rankings only (W-3) because it has been ranked in only four of the states where it occurs. Based on known herbarium records and other sources (see appendices), this herb would appear to occur most frequently in Arkansas (46 counties), Mississippi (41 counties), Louisiana (38 parishes), and Missouri (29 counties). Whiteleaf Mountainmint is local within most of its range, though it can be locally common. Records from floras and herbarium labels show that this herb has been found in more than 25 counties or parishes in Arkansas, Louisiana, Mississippi, and Missouri, and in at least 10 counties in Florida and Texas. In the remaining seven states, *Pycnanthemum albescens* has been found in 5 or fewer counties, though its frequency within each county can be greatly variable. Additional details on the distribution of this herb can be found in Kartesz and Meacham (1999) and several Internet sites (*e.g.*, W-1, W-3). Representative specimens of this herb have been listed in Appendix 1. A summary of the distribution of the Whiteleaf Mountainmint has been presented in Appendix 2. It must be noted here, that the accuracy of the literature and herbarium records depends upon the accuracy of the specimen identifications;

for years, many of these specimens may have been confused with similar taxa, and other specimens may be hybrids.

In the central states, the species has been found in Illinois (where it is at its northern range limit in the extreme southwestern corner of the state) as well as in neighboring Kentucky and Missouri, but not in adjacent Indiana or Iowa ([W-1](#), [W-3](#)).

Within the U.S. Forest Service Eastern Region (Region 9) *Pycnanthemum albescens* has been found within the Shawnee National Forest in Illinois and the Mark Twain National Forest in Missouri. It is considered by the Forest Service to be at risk in Illinois but not in Missouri where it is more common. It has not been found in the Hoosier National Forest or anywhere else in Indiana. It is unlikely to be present within other Region 9 forests because of its more southern and southwestern distribution. It is found in several National Forests in the southeast, in Region 8, including the Conecuh National Forest (AL), Ouachita National Forest (AR and OK), Ozark National Forest (AR), Apalachicola National Forest (FL), Kisatchie National Forest (LA), Bienville National forest (MS), De Soto National Forest (MS), Davy Crockett National Forest (TX), Sabine National Forest (TX), and, undoubtedly, others (see appendices).

In Illinois, where it is listed as Endangered, the species has been reported historically in Union County only (Herkert and Ebinger 2002; Mohlenbrock 1986, 2002; Mohlenbrock and Ladd 1978; Shawnee National Forest 2005) but it has not been reported in several years. The Union County site is within the Shawnee National Forest, where it was reported from cherty limestone slopes at LaRue-Pine Hills / Otter Pond Research Natural Area in 1973 (Shawnee National Forest 2005). It has not been relocated at this site since 1977 and it may be extirpated in the state, yet there remains considerable suitable habitat for it in the Ozark Hills area. In Illinois, it is restricted to the Southern Section of the Ozark Natural Division (Schwegman *et al.* 1973; Herkert and Ebinger 2002).

In Missouri, *Pycnanthemum albescens* is much more widespread, and it has been reported from at least 28-29 counties in the southern and southeastern third of the state, primarily in the Ozark region (Steyermark 1963; herbarium specimens). This area includes the Mark Twain National Forest.

The populations of this herb in Illinois, Kentucky, and parts of Missouri in the Midwest are scattered widely and the populations are isolated from one another. It is possible that the species was somewhat more common in the region at the time of European settlement, but there is no direct evidence for this because there are few early herbarium records from that period here. The forests in the region are thought to have been kept open by means of fires set by the earlier inhabitants in the area before European settlement, and there is some evidence that *Pycnanthemum albescens* thrives far better in open forest areas; the suppression of fires later may have led to a decline in the number of populations. However, it is just as likely that

open woodlands where it may have occurred have been developed or disturbed by agriculture and housing in the past 200 years, in which case there may have been a significant population decline for that reason as well.

There is only a little data available on population sizes for this herb, and herbarium label data rarely include its local frequency or abundance. The few notations seen on the specimens from Alabama, Missouri, and Texas indicated ‘common’, ‘infrequent’, or ‘scattered’ within their specified habitats. There is little data on the density of the populations and the area covered by each. Some colonies consist of a few scattered plants in patches found over a relatively wide area (Hill, pers. obs.).

## PROTECTION STATUS

The Nature Conservancy ranking for *Pycnanthemum albescens* is G5 (Secure; [W-3](#)), indicating that the species is secure worldwide. In the United States, overall, the species is given the National Heritage rank of NNR, for unknown reasons. It may be unranked nationally because so few states have ranked the plant, but there is likewise little evidence that the species is as common as the rank of G5 suggests.

In the United States, official protection for this herb outside of Forest Service lands depends upon state and local laws because it is not listed as federally threatened or endangered. Significant populations of this species still occur in National Forests.

The state rankings vary somewhat. *Pycnanthemum albescens* is listed as Endangered (and ranked as S1, Critically Imperiled) in Illinois (Illinois Endangered Species Protection Board 2005; Herkert and Ebinger 2002, as “White Mountain Mint”) and Kentucky ([W-3](#); [W-5](#)). It has been ranked as Critically Imperiled to Imperiled (S1S2) in Georgia where it has been included on the state list of plants of Special Concern. This species has also been listed as historic only (SH, presumed extirpated) in Kansas. It is not ranked (SNR, SU) in any other state where it occurs. While included by many in North Carolina, there appear to be no validated reports of the species in that state. It is at risk at the margins of its range.

In Forest Service Region 9, the Whiteleaf Mountainmint is included on the Regional Forester Sensitive Species list (RFSS) for the Shawnee National Forest but not the Hoosier National Forest, where it has not been found ([W-6](#); Shawnee National Forest 2005). It occurs in the Mark Twain National Forest in Missouri, but it is considered to be too common there to be included on its Regional Forester Sensitive Species list.

Table 2 lists the official state rank for *Pycnanthemum albescens* assigned by each state’s Natural Heritage program according to the Nature Conservancy at their Internet site ([W-3](#)). Appendix 3 explains the meanings of the acronyms used ([W-7](#)).

A summary of the current official protection status for *Pycnanthemum albescens* follows:

<u>U.S. Fish and Wildlife Service:</u>	Not listed (None).
<u>U.S. Forest Service:</u>	Listed as at risk in the Shawnee National Forest only, Region 9
<u>Global Heritage Status Rank:</u>	G5
<u>U.S. National Heritage Status Rank:</u>	NNR

Table 2: S-ranks for *Pycnanthemum albescens* [Heritage Element Code: PDLAM1N010]

<u>State/Province</u>	<u>Heritage S-rank</u>		
<b>UNITED STATES</b>			
Alabama	SNR	Illinois	S1 [Endangered]
Arkansas	SNR	Kansas	SH [Historic]
Florida	SNR	Kentucky	S1 [Endangered]
Georgia	S1S2 [Special Concern]	Mississippi	SNR
		Missouri	SNR
		North Carolina	SU
		Oklahoma	SNR
		Texas	SNR

## LIFE HISTORY

*Pycnanthemum albescens* is a rhizomatous perennial herb that can form colonies. The species is perennial, rhizomatous, and occurs as scattered patches of individual plants with one or more stems.

Studies have shown that the species (as well as its close relatives) is somewhat self-compatible but that fertility greatly increases with outcrossing (Chambers 1961). The individual flowers contain both male and female parts; the many flowers in each cluster open over a period of time and they are insect pollinated. The flowers produce nectar and are frequently visited by insects. In Louisiana, the following insects (bees) have been collected on *Pycnanthemum albescens* flowers: *Lasioglossum (Dialictus)* sp., *Bombus bimaculatus*, *Bombus impatiens*, *Bombus griseocollis*, and *Xylocopa virginica virginica* (Bartholomew 2004). Wasps of several species are also frequent visitors of *Pycnanthemum* flowers (Hill, pers. obs.).

Studies have also shown that the Whiteleaf Mountainmint can readily hybridize with closely related species, resulting in the loss of the ‘pure’ species. This presents both taxonomic and management problems.

*Pycnanthemum* in general and this species in particular contain aromatic oils throughout the plant, and these are thought to repel insects and to usually prevent animals from eating them. There is at least one report, however, that lists this mint as being occasionally browsed by deer in Louisiana (Moreland 2005). The oil from *Pycnanthemum albescens* is known to have insect repellent and antifungal properties (Eickholt and Box 1965) and it is a volatile oil similar to peppermint oil, composed primarily of terpenes, with no menthol component. Toxicity tests have been investigated with this oil and it was found to be even less toxic to mice than peppermint oil, and thus possibly suitable for human consumption. The lower toxicity is thought to be due to the lack of menthol in this oil (Eickholt and Box 1965).

The Whiteleaf Mountainmint’s flowering period is generally from early July to late September throughout its range. In Alabama, flowers have been found on plants as late as October 18 and in Texas until at least October 25. The earliest date for flowering seen on the herbarium specimens examined for this report was July 9. The fruiting period is generally from 25 August to 30 October. Herbarium specimens suggest that peak flowering is in early September and peak fruiting is in mid-October.

Data on the longevity of individual plants of this species is lacking. Based on its habit and appearance, it probably follows the same general pattern as *Pycnanthemum incanum* and similar genera such as *Monarda* – perennials that are nonetheless fragile and doubtfully persist more than 3-10 years at a site (Hill, pers. obs.). In mild or hospitable conditions, and because the plants are capable of rooting from the lower stem nodes, it would seem that a colony could persist indefinitely through vegetative expansion, but no studies are known that either support or refute this hypothesis. Likewise, though the plants are capable of producing hundreds of seeds in a given year, there is no data on the survivability of seedlings or the establishment of new colonies available.

The fruiting stems are herbaceous and not especially durable and they rarely last through the winter. They persist long enough to fling seeds around after they are ripe, so that strong winds or animals brushing against plants might contribute to dispersal; no other seed dispersal mechanism is known for these plants. This means of dispersal may be comparable for that studied in *Chamaelirium luteum*, another species with a tall, springy fruiting stem. Regarding *Chamaelirium*, Meagher and co-workers surmise that since the flowering stalk of *C. luteum* is somewhat springy, seeds may be disengaged and thrown from the capsules if the stalk is pulled back and released. The height of the plants may be an adaptation to increase the distance to which seeds can be spread (Meagher 1978, Meagher and Antonovics 1982). Studies in one mapped North Carolina population of *Chamaelirium* (Meagher and Thompson 1987) revealed



that seed dispersal distances averaged 10.1 – 10.4 m. Their height, being somewhat similar to that of *Pycnanthemum albescens*, may be comparable that that species as well. The plants using this type of seed dispersal, often called the ‘slingshot effect’, have been referred to as ‘Passive Balists’ [as in ballistics] by van der Pijl (1969). While *Pycnanthemum* is not specifically detailed, Bouman and Meeuse (1992) have presented much information on the dispersal of the nutlets in the mint family.

At least one website (<http://ivygarth.com/images/Perennials.htm>) suggests that light is needed for germination of *Pycnanthemum* seeds, and that an ideal germination temperature is between 68 – 75 ° F. Information on the need for stratification or conditions for seed dormancy is lacking.

## POPULATION BIOLOGY AND VIABILITY

The Whiteleaf Mountainmint, with at least 100 flowers in each inflorescence head, is known to produce seeds successfully, especially as a result of outcrossing (Chambers 1961). It also is visited and pollinated by a diversity of insects, especially bees (Bartholomew 2004). No reproductive problems have been demonstrated in the species other than decreased fertility with self pollination. Beyond this, little has been reported on other aspects of population biology in *Pycnanthemum albescens*. The survival rate of seedlings in the wild is not known. As stated in the section on Distribution and Abundance above, the local frequency or abundance of individuals within its populations has only rarely been recorded, and herbarium labels have yielded only general information such as ‘common’, ‘infrequent’, or ‘scattered’ within populations and there is little additional data on the density of the populations and the area covered by each. This is not unusual. Even the more common species in our flora have only limited population data available. As evidenced by the distribution of this species as well as by its ranking of Secure (G5) by the Nature Conservancy (W-3), populations of this species are rather numerous in some states, and these populations appear to be fully viable. As a perennial adapted to often shallow soils and dry conditions, *Pycnanthemum albescens* appears to be resistant to drought conditions and some local perturbations of its environment, including fire. It is more likely that long-term changes or sudden environmental destruction would be responsible for the loss of a population (see Threats section below).

*Pycnanthemum albescens* has a typical life history for a perennial herbaceous mint. Its population dynamics are largely unknown, however. As in the case of other mints, the aromatic oils, found throughout the plant, appear to be effective in repelling grazing insects as well as many foraging mammals, and the same oils may also prevent some plant fungus attacks (Eickholt and Box 1965). These chemical defenses, common among mints, certainly benefit the viability of this species even when the populations are small. The species is insect pollinated and grows in open dry forests. It appears that one of the typical landscape patterns for the plant is to have individuals growing significant distances from one another, but specific data on this and on population sizes per unit area are not available. It is possible that small populations of widely



scattered plants may not produce many seeds during years in which insect populations are stressed or during droughts when the plants have insufficient water to flower, and this could result in long-term population declines if the situation persists.

It is generally understood that fertility is reduced in inbred populations through the process of autogamy (self-fertilization). Autogamy is useful to the plant when there are small numbers of individuals per area, since the safeguarding of the success of propagation is more important than the production of new genotypes. In primary habitats, those that are generally poorly vegetated, initial success is very important. However, in subsequent periods of vegetation increase, pioneers are often substituted by other, more competitive species (W-8). In plants such as Whiteleaf Mountainmint, all individuals at a site may be very closely related (or even clonal) and they can be progeny from a single introduction event, and so they may possess little genetic variability. Fertilization by siblings is the most likely outcome in such cases because there is almost no chance of fertilization by other genotypes unless they are within dispersal range. The populations of this herb in Illinois are isolated from one another by the nature of their habitat and from those in other states. In theory, continued fertilization within a group of closely related individuals can result in severe reproductive problems in these few isolated populations, and successful seed production, as well as the genetic variation that allows competition with other species, may be compromised (W-8). In *Pycnanthemum*, hybridization experiments have shown that some hybrid individuals with other related species are infertile (Chambers and Chambers 1971). Gene pool dilution of *Pycnanthemum albescens* could, hypothetically, result if a tiny population of that species has only numerous individuals of a sibling species, such as *Pycnanthemum incanum*, with which to breed.

An example of negative effects thought to have arisen through the isolation of populations can be seen in the case of a monocot, Offer Hollow Reedgrass (*Calamagrostis porteri* ssp. *insperata* (Swallen) C.W.Greene), which has become isolated on rather dry sandstone bluffs throughout its range. This grass almost never produces viable seed anywhere in its range and this reproductive failure may be a reflection of a high genetic load that has occurred as a result of its long isolation (see Hill 2003). High genetic load can be seen in dominant mutations that result in factors lethal to embryos, and this situation appears to be indicated in that grass. That plant survives as a rare relict in the vegetative state only. It is a vulnerable species in the Midwest and elsewhere, though it does appear to be secure in some other areas with suitable habitat remaining. Whether that grass or the Whiteleaf Mountainmint persist or not in the future in areas where they are currently scarce appears to depend on the survival and maintenance of their habitats.

## POTENTIAL THREATS

Globally, Whiteleaf Mountainmint has been judged to be secure, but it is a North American endemic with a limited overall range and the number of populations is declining (W-1; W-3). It appears to be unable to increase its range, possibly due to sensitivity to cold and a lack of

specialized dispersal mechanisms.

Threats to this species include 1] habitat destruction from urbanization and development, 2] both clear-cutting of the surrounding forest as well as woody succession and canopy closure, 3] cattle and horse trampling, 4] unrestricted recreational use of its habitat, 5] exotic plant competition, 6] hybridization with other closely related taxa, and 7] industrial, agricultural and domestic pollution (W-3; W-5; Shawnee National Forest 2005). The plant is also known to be used as a medicinal plant, and this may further threaten the small populations of the plant.

Habitat destruction from urbanization and development can completely eliminate entire populations of plants as well as the habitats on which they depend. This has become a serious problem not only in Whiteleaf Mountainmint populations elsewhere, but also for many other species, and it is a national problem (W-3). Since European settlement, much of the previously available habitat has been destroyed, converted to cultivated fields, orchards, or commercial forests, or it has succumbed to land development (W-3). Many extant populations are in national forests or protected areas, and these have only been found as a result of careful searches at these sites in recent decades; it cannot be determined precisely how many populations were lost at other sites before field botanists began to recognize the decline of this mint and before searches were initiated.

Clear-cutting of the surrounding forest is a known threat to the Whiteleaf Mountainmint (W-5). Exposed plants can wilt quickly and die because their root systems are normally quite shallow. Direct sun tends to remove more water from the plants than they can take up by their weak root system, resulting in eventual decline and death of individuals and populations if the forest cover is completely removed. Furthermore, clear-cutting can change the hydrology and drainage patterns of the forest slopes (W-3). Increased runoff can heighten the frequency and intensity of flooding and subsequent scouring of the shallow soils in which *Pycnanthemum albescens* often grows. The siltation from the runoff can prevent seedling establishment. Complete clearing or cutting of a forest stand could not be done where a colony occurs nor within its watershed upslope without such adverse effects.

In apparent contradiction, excessive shading generally through woody plant succession within its habitat can also be detrimental to the Whiteleaf Mountainmint (Shawnee National Forest 2005). This is not really a contradiction, because this mint prefers open sunny woodland habitats – not fully exposed, but with dappled sunlight in open barrens or savanna-like habitats. Its preferred habitats are subject to occasional fires that keep the understory quite open (see Habitat and Ecology above). The low light levels created by a dense growth of trees and shrubs and the closing of the forest canopy would prevent significant amounts of light from reaching the plants, resulting in a suppression or even cessation of flowering and fruiting.

Cattle and horse trampling is another potential threat to this herbaceous species. The unrestricted

human recreational use of its habitat poses a similar threat. The development of user-created trails in the Shawnee National Forest is thought to pose a major threat to several rare plant populations because of the resulting trampling of the plants. The compaction and / or the loss of the thin soils present can cause a plant colony destruction by human, equestrian, or vehicular traffic. The strongly-pungent plants are normally not subject to grazing or browsing by wild or domestic animals, but the results of feeding experiments of this mint to domestic livestock are not known.

Exotic pest plants are a threat to this species and should be removed. The Whiteleaf Mountainmint is not an aggressive or competitive herb. Movement of exotic aggressive plant species into an area is often by means of trail or road construction (W-5). The plants that may cause competition problems for *Pycnanthemum albescens* in Illinois may include (but are not restricted to) kudzu (*Pueraria lobata*), Japanese honeysuckle (*Lonicera japonica*), Autumn olive (*Elaeagnus umbellata*), Sericea lespedeza (*Lespedeza cuneata*), species of privet (*Ligustrum* spp.), and Multiflora rose (*Rosa multiflora*).

As stated above in the section on Life History, *Pycnanthemum albescens* is known to hybridize with other similar local species, especially *Pycnanthemum incanum* and its varieties. If only a small population were to exist in an area where *Pycnanthemum incanum* was far more common, it could be possible that the species would disappear through introgression with the more common species – causing, in effect, a local extinction due to gene pool dilution.

Various types of industrial, agricultural and domestic pollution may have caused the loss of several populations of Whiteleaf Mountainmint around the country. The influx of excrement from horses and other domestic animals as well as the dumping of household and industrial trash can increase the growth of agricultural weeds that would soon overtake and replace populations of this mint. It can also be assumed that herbicides will easily eliminate this plant from an area. Such commonly used herbicides as Roundup are known to be particularly effective against broadleaf herbs, and so herbicides should not be used in the vicinity of these plants. Fire may be an effective means of control for some of the exotic species that may become a problem because this mint is thought to be rather resistant to fire.

The fact that *Pycnanthemum albescens* can be used as a medicinal plant may threaten some smaller populations (W-3). Whiteleaf Mountainmint was once harvested for use as a medicinal herb (Moerman 1998). The leaves are diaphoretic, and a tea made from the steeped leaves has been used against colds, fevers, and digestive ailments such as excessive gas. However, this mint is rarely harvested in any quantity today.

It is generally believed among biologists that habitat fragmentation can have profound effects on the success and persistence of local populations. Over time, as populations become increasingly more isolated, the effects of fragmentation can potentially be observed at the molecular level by

reduced genetic frequencies caused by random drift (Barrett and Kohn 1991). When one is considering populations that are already isolated, as in the case of the Illinois populations, random genetic drift may have already occurred and may have caused negative effects to the species.

At the current time, it is not known if populations of *Pycnanthemum albescens* persist in the Shawnee National Forest (or in Illinois). If the species is re-located, it will likely persist if it is protected from habitat change and disturbance.

## RESEARCH AND MONITORING

*Pycnanthemum albescens* regularly flowers and fruits throughout its range and it has no known reproductive problems. This herb grows in widely scattered and often isolated open forest sites at the margins of its range and there appears to be very little interaction (pollen dispersal or seed exchange) with other populations of the same species in those areas because of its rarity.

The first priority in the research and monitoring of this mint in Illinois is to locate an extant population, of course.

If a population is again found in Illinois, annual monitoring of it will be essential to the local survival of this species. In parts of its range, both in areas where it is declining and in areas where it is still common, periodic monitoring is needed not only to supply data on the life history of this herb, but also to evaluate the threats to its habitat caused by habitat degradation or destruction, and threats from exotic species. Population stability, reproduction, and vigor should all be monitored. The searches for additional populations are especially needed to re-evaluate the plant's status. While hydrology and humidity fluctuations are assumed to occur in its habitat, it is not known precisely how much fluctuation can occur without adversely affecting the plants. It is also not known how well this herb can be established in newly opened forest sites, though it is probable that it could be successfully introduced to such sites based upon current knowledge of its habitat preferences. It is not known exactly how much disturbance can occur before an individual population is adversely affected, nor is it known how large an open habitat is needed to support a viable population. In particular, research on the use of fire management, already shown to have promising results, would be useful towards the understanding and preservation of the Whiteleaf Mountainmint.

Monitoring of the forests where it occurs elsewhere or where it has been introduced may assist in determining what the local environmental parameters should be for optimal health for this herb. Where it still occurs, periodic surveys are needed to determine the basic health and productivity of the population by periodically counting the numbers of individuals. This is the only means to determine population trends accurately (W-3). Reproductive success can be estimated by counting the number of fruiting stems produced each season because seedlings and young plants

cannot easily be identified in the field. As part of the basic research on current populations of this species, data such as counts of numbers of individuals present (or the area covered by the colony), the determination of the amount of yearly flowering and seed production that might occur, and an assessment of recruitment rates are needed in order to monitor population dynamics and to assess the viability of the individual populations found. Individual plants should be monitored over a growing season at each site for basic phenology data. Such basic facts as fungal associations (if any), longevity, and yearly variations in colony size over a long period are not precisely known.

Once new populations are found, voucher specimens should be made according to techniques described in Hill (1995) or other similar references. Similar habitat should be explored for the plant at its flowering and fruiting seasons. There are rather large areas of additional suitable habitat in southern Illinois where the herb could also exist. A list of associates and indicator species has been compiled as a result of field studies in other states, especially Missouri, (see Habitat section above) and these should also occur with the species in Illinois. These indicator plants can be very useful in facilitating the discovery of additional populations of this herb. Particular attention should be made to search for and / or monitor this herb at its peak period for flowering in one's local area, probably in early September (see cover illustration). It is quite possible that populations of this species either have been overlooked because of difficulties in field identification (mistaking it for *Pycnanthemum incanum*) or because of the predominance of sterile plants.

Botanical surveys conducted by scientists from the Illinois Natural History Survey and elsewhere have shown repeatedly that with sufficient time and funding, and an experienced eye, many plants thought to be extirpated or else threatened or endangered occasionally can be found at additional locations (Hill 2002). These sorts of investigations have been important in that they have led not only to the de-listing of species once thought to be rare, but they have also resulted in the discovery of species previously unknown in the state. The U.S.D.A. Forest Service and other related agencies have done a fine job in the effort to preserve rare species with the resources that they have available. Much of the locating and monitoring of known populations of rare species in southern Illinois has been conducted by Forest Service biologists, consultants, and students in cooperation with Illinois Department of Natural Resources personnel. However, a continuing problem is that there is neither sufficient funding nor are there enough botanists available to survey the immense area that needs to be covered in the monitoring of the large numbers of sensitive plants, including this one. It appears that a high priority should be given to the training and hiring of more qualified field botanists to achieve these goals.

It is generally understood by botanists that fertility is normally reduced in inbred populations through the process of autogamy (self-fertilization). Autogamy is useful to the plant when there are small numbers of individuals per area, since the safeguarding of the success of propagation is more important than the production of new genotypes. *Pycnanthemum albescens* generally

discourages inbreeding because the individual plants are partly self-compatible, restricting the number of self-pollinated progeny. Individuals in such a population can, however, be very closely related, and can even be progeny from a single introduction event, and so they can possess little genetic variability. Fertilization by siblings is the most likely outcome in such cases because there is almost no chance of fertilization by other genotypes unless they are within dispersal range. The population of this herb in Illinois was isolated from any another and from those in other states. In theory, continued fertilization within a group of closely related individuals can result in severe reproductive problems in these few isolated populations, and successful seed production as well as the genetic variation that allows competition with other species may be compromised (W-8). The species may have disappeared as a result of inbreeding decline or it may have hybridized out of existence locally with other very closely related species, though there is no data to support this.

An example of negative effects thought to have arisen through isolation of populations can be seen in the case of a monocot, Offer Hollow Reedgrass (*Calamagrostis porteri* ssp. *insperata* (Swallen) C.W.Greene), which has become isolated on rather dry sandstone bluffs throughout its range. This grass almost never produces viable seed anywhere in its range and this reproductive failure may be a reflection of a high genetic load that has occurred as a result of its long isolation (see Hill 2003). High genetic load can be seen in dominant mutations that result in factors lethal to embryos, and this situation appeared to be indicated in that grass. That plant survives as a rare relict in the vegetative state only.

There is no data at this time on the fertility of the seeds produced in the single known Illinois population of *Pycnanthemum albescens*. While it is a vulnerable species in the Midwest, the Whiteleaf Mountainmint does appear to be secure in other areas with suitable habitat remaining. Whether it persists or not in the future in areas where it is currently scarce appears to depend on the survival and maintenance of its habitat.

## RESTORATION

There are no known restoration efforts being conducted on *Pycnanthemum albescens* anywhere in its range and the restoration potential of this species is largely unknown. It can be grown dependably from seeds, and it may also be propagated by means of rooted rhizome cuttings. Restoration efforts of several habitats where it grows are taking place throughout its range, and this may also help the species if it occurs on one or more of those sites.

The generally recommended method to restore populations of this and other rare plants is to protect and manage their habitat. Protection of the thin soil layer of the sites may be crucial, along with the maintenance of an open habitat. Girdling trees may be effective, as may be selective mowing (trimming) at a prescribed height (perhaps 1 meter). Exotic and aggressive species must be completely eliminated from each site. This would entail physically pulling them

out because it is very likely that herbicide application would eliminate this species at a site as well. The use of controlled burns, the thinning of the overstory, and the thinning of competing understory species may be very beneficial to this plant (Shawnee National Forest 2005).

Restorations of native plant species are recommended using only propagated material grown from native, local populations to avoid mixing genotypes not adapted to the local conditions and to avoid compromising the local gene pool. If this rule is not followed, the result is generally the loss of plants because they are not competitive under local conditions, or the result could be the success of a plant or plants that cannot be considered truly native (considered by some to be a plant community *reconstruction* rather than a restoration). Local plants should be propagated for planting in such an effort. Mints are normally easily propagated by means of seeds or rhizome cuttings under controlled conditions. If this plant is not found again in Illinois, and its restoration is still desired, material from nearby Missouri should probably be obtained to establish a new population.

This mint is sometimes grown in cultivation because of its uses as an ornamental, beverage, and medicinal plant. It is only rarely available as seeds or plants from nurseries, however.

In summary, the management of any extant colonies of *Pycnanthemum albescens* should include the possible closing of trails that may cause damage to the colonies, continued experimental investigation of management techniques such as the use of prescribed fire or the selective thinning of the canopy in order to maintain suitable light levels for growth and flowering, and the elimination of woody plant encroachment in the understory, particularly that of exotic species. Habitats need protection from destructive recreational activities, land development, indiscriminate herbicide application, trampling by native and non-native mammals, and from the establishment of any exotic species (W-3). Again, at this time, the priority should be to find any extant colonies of the species, or there will be nothing to protect and manage.

## SUMMARY

The Whiteleaf Mountainmint, *Pycnanthemum albescens* Torr. & A.Gray, is a very fragrant, perennial rhizomatous herb normally found in drier uplands, and it has short-pubescent whitish bracts, with multiple few-branched 4-angled [square] hollow stems. The species is known only from the United States where it has a somewhat scattered distribution in the southeastern, central, and plains states, and it is known historically from thirteen states, from Illinois, Kentucky and North Carolina south and west to Florida, Texas and Kansas. It has declined in recent decades. Globally, its ranking is G5 (secure world-wide); its National status in the United States is NNR (it has not been ranked nationally). The Whiteleaf Mountainmint is listed as Endangered in two states, Illinois and Kentucky. The species is known only from historic records in Kansas, and it has been listed as a plant of Special Concern in Georgia. In Forest Service Region 9, the Whiteleaf Mountainmint is included on the Regional Forester Sensitive Species list (RFSS) for

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the Shawnee National Forest but not the Hoosier National Forest where it has not been found. It is at risk at the margins of its range.

Suggested research priorities for this rare herb include attempts to locate and protect any extant populations because it has not been seen in Illinois since 1977. Once found, there should be an initiation of studies on the effects of fire or canopy thinning on its survivability and reproduction in southern Illinois, a study to learn more about its successful propagation and restoration in the wild, and studies on the techniques on how best to protect its habitat from disturbance. Many basic facts about the plant's life history remain unknown, such as seed dormancy and viability, and plant longevity as well as its genetic diversity. Management through strict protection of its habitat, either through enforcement of existing regulations or through the creation of new rules for restricted access (particularly recreational and equestrian access) to any discovered sites, appears to be necessary to allow it to persist where it may occur. At this time, the establishment of additional populations will be only through active human efforts.

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## APPENDIX 1

### Representative specimens of *Pycnanthemum albescens* examined or cited in the literature

#### Herbaria:

ILLS = Illinois Natural History Survey, Champaign. LSU = Louisiana State University, Baton Rouge. MO = Missouri Botanical Garden, St. Louis. MU = Miami University, Oxford, OH.

**ALABAMA:** ESCAMBIA CO., Co. Rt. 27, ca. 1.5 mi NNE of Flomaton, 7 Oct 1968, *Kral 33803* (MO); GENEVA CO., ca. 4.5 mi S of jct. AL 52 and AL 153, 18 Oct 1977, *Kral 61122* (MO); JEFFERSON CO., woods near 'Wansian', 16 Sep 1897, *Eggert s.n.* (MO); MOBILE CO., Bienville Blvd. W of Le Moyne Dr., Dauphin Island, 3 Aug 1964, *Deramus D217* (MO).

**ARKANSAS:** ASHLEY CO., Chemin a Haut Creek bottoms, Hamburg, 27 Sep 1937, *Demaree 16350* (LSU, MO); CARROLL CO., Eureka Springs, 1 Oct 1913, *Palmer 4546* (MO); CLARK CO., Caddo Valley, Arkadelphia, 17 Jul 1968, *Demaree 58688* (MU); GARLAND CO., Hot Springs, 9 Jul 1896, *Eggert s.n.* (MO); GREENE CO., On Crowley's Ridge, west of Paragould, 2 Sep 1967, *Evers 93092* (ILLS); HOT SPRINGS CO., Fenres near Malvern, 9 Jul 1896, *Eggert s.n.* (MO); Magnet Cove, 4 Sept 1937, *Demaree 16210* (MO); LOGAN CO., Magazine Mountain, 25 Aug 1937, *Demaree 16052A* (MO); PERRY CO., jct. AR Rt. 7 and AR Rt. 60, 3 Aug 1991, *Vincent 4886* (MU); PIKE CO., Wolf Creek banks, Delight, 1 Oct 1938, *Demaree 18432* (MO); 3 mi N of Murfreesboro, 28 Sep 1932, *Demaree 9371* (MO); PRAIRIE CO., Grand Prairie, Hazen, 28 Jul 1937, *Demaree 15472* (LSU, MO); PULASKI CO., Little Rock, 9 Aug 1939, *Demaree 19779* (MO); SEVIER CO.: Locksburg, 30 Oct 1932, *Demaree 9896* (MO); SHARP CO., Hardy, Aug 1913, *Emig 68* (MO); YELL CO., Ouachita National Forest, Steve [PO], 28 Aug 1937, *Demaree 15925* (MO).

**FLORIDA:** GADSDEN CO., Aspalaga, 20 Oct 1897, *Chapman s.n.* (MO); near River Junction, 8 Sep 1897, *Curtiss 5981* (MO-Hamer 1990 det. "Hybrid ? calyx intermediate with *P. incanum* (L.) Michx. ssp. *loomisii* (Nutt.) Hamer").

**ILLINOIS:** UNION CO., 1.5 mi SE of Lick Creek, 7 Oct 1939, *Anderson & Bauer s.n.* (MO).

**LOUISIANA:** CLAIBORNE PARISH, Kisatchie National Forest, E of FS 911 N of LA Rt. 9 and Antioch, 23 Aug 1996, *Thomas 151458* (MU); LINCOLN PARISH, Hilly Fire Tower, 20 Oct 1971, *Hunter 115* (MO); NATCHITOCHES PARISH, Chopin, 5 Oct 1915, *Palmer 8828* (MO); OUACHITA PARISH, W of LA 557 just north of Caldwell Parish line, 31 Aug 1983, *Taylor 5224* (MU); WEBSTER PARISH, E of LA 160 just SW of Bayou Dorcheat between Cotton Valley and Leton, 18 Aug 1993, *Thomas 136417* (MO).

**MISSISSIPPI:** ADAMS CO., near Natchez, 10 Sep 1886, *Smith 55* (MO); HARRISON CO., Long Beach, 10 Aug 1891, *Joor s.n.* (MO); Saucier, 22 Jul 1970, *Brown 21554* (LSU); JACKSON CO., Ocean Springs, 29 Jul 1896, *Pollard 1115* (MO); PEARL RIVER CO., about 6 mi NW of Poplarville, 4 Aug 1978, *Darwin et al. 733* (MO); 1 mi W of Picayune, 4 Aug 1968, *Sargent 9721* (MO); SIMPSON CO., Saratoga, 1 Aug 1903, *Tracy 8758* (MO); WAYNE CO., Waynesboro, 8-9 Aug 1896, *Pollard 1247A* (MO); WILKINSON CO., near Centerville, 26 Aug 1888, *Joor s.n.* (MO).

**MISSOURI:** BARRY CO., Seligman, 21 Aug 1892, *Dewart s.n.* (MO); BUTLER CO., Neeleyville, 16 Sep 1919, *Palmer 16458* (MO); DENT CO., Gayton, 28 Aug 1909, *Kellogg s.n.* (MO); HOWELL CO., along Noblette Creek, 4 mi SW of CCC camp F-6, 12 Sep 1936, *Steyermark 20061* (MO); McDONALD CO., Southwest City, 29 Aug 1923, *Bush 10179* (MO); OZARK CO., Gainesville, fl, 28 Jul 1933, *Kellogg s.n.* (MO); PULASKI CO., tributary to Big Piney River 4 mi SE of Tribune, 28 Aug 1937, *Steyermark 25508* (MO); S of Wildcat Shoals Bridge, 19 Aug 1989, *Ovrebo & Sladewski W0784* (MO); RIPLEY CO., Bay Mills, 22 Jul 1897, *Mackenzie 394* (MO); SHANNON CO., Monteer, common in woods, 31 Jul 1899, *Bush 209* (MO); STODDARD CO., Blackshire Branch, 0.5 mi E on Hwy 60 N of Dexter, 8 Sep 1993, *Holmes 1121* (MO); TEXAS CO., ca. 3.5 air miles N of Mountain View, 27 Jul 1990, *Yatskievych & Summers 90-256* (MO); WAYNE CO., S-facing slopes of Clark Mountain, 29 Jul 1994, *Brant 3031* (MO).

**OKLAHOMA:** CHOCTAW CO., Jasper, 13 Jul 1916, *Palmer 10477* (MO); LEFLORE CO., near Page, 27 Aug 1914, *Blakley 3422* (MO); near Page, 8 Sep 1913, *Stevens 2680* (MO); PUSHTAMAHA CO., Antlers, 23 Oct 1915, *Palmer 9003* (MO).

**TEXAS:** BOWIE CO., near Texarkana, 30 Oct 1925, *Palmer 29427* (MO); BRAZOS CO., College Station, 24 Jul 1899, *Reverchon s.n.* (MO); CHEROKEE CO., Jacksonville, 21 Sep 1915, *Palmer 8603* (MO); HARRIS CO., Houston, 25 Oct 1900, *Bush 1605* (MO); HOUSTON CO., 7.8 mi E of Crockett, National Forest Rd 565, Davy Crockett National Forest, 20 Sep 1991, *Sherman et al. 264* (MO); POLK CO., Livingston, 7 Oct 1914, *Palmer 6755* (MO); RUSK CO., Jul to Sep, *Vinzent 65* (MO); SABINE CO., Sabinetown, 21 Sep 1940, *Parks s.n.* (MO); SAN JACINTO CO., Big Creek, near Coldspring, 20 Sep 1975, *Hill 3624* (VT); SMITH CO., N of Hopewell Baptist Church at Swan, 20 Oct 1965, *Correll & Correll 32027* (MO).

## APPENDIX 2.

### The Historic Distribution of *Pycnanthemum albescens* in the United States. Information from herbarium specimens and the literature.

STATE	COUNTIES	NOTES
Alabama	Escambia, Geneva, Jefferson, Mobile	W-1; W-3; herbarium specimens; includes Conecuh N.F.
Arkansas	46 counties, widely scattered	W-1; W-3; Smith (1978) “Including Arkansas reports of <i>P. incanum</i> , not (L.) Michx. A putative hybrid between this species and <i>P. pilosum</i> has been collected in Randolph County: <i>Demaree 23720</i> (SMU).” Includes Ouachita N.F., Ozark N.F.
Florida	Escambia, Gadsden, Holmes, Jackson, Jefferson, Leon, Liberty, Okaloosa, Santa Rosa, Walton, Washington	W-1; W-3; includes Apalachicola N.F.
Georgia	Cobb, Decatur, Dekalb, Grady	W-1; W-3;
Illinois	Union	W-1; W-3; Herkert and Ebinger (2002); Mohlenbrock and Ladd (1978); Mohlenbrock (1986, 2002); includes Shawnee N.F.
Kansas	Cherokee [Historic only]	W-1; W-3;
Kentucky	Calloway	W-1; W-3
Louisiana	38 parishes, nearly throughout except SE delta.	W-1; W-3; MacRoberts (1989); Thomas and Allen (1998); includes Kisatchie N.F.
Mississippi	41 counties, mostly southern half of state, but also elsewhere	W-1; W-3;



Missouri	Barry, Bollinger, Butler, Cape Girardeau, Christian, Dent, Douglas, Dunklin, Howell, Iron, Madison, McDonald, New Madrid [?], Newton, Oregon, Ozark, Perry, Phelps, Pulaski, Reynolds, Ripley, Shannon, Ste. Genevieve, Stoddard, Taney, Texas, Washington, Wayne, Wright [29]	W-1, W-3; Steyermark (1963); including Mark Twain N.F.
North Carolina	<i>Pycnanthemum incanum</i> is in > 50 counties throughout, but <i>P. albescens</i> probably does not occur in the state	Radford <i>et al.</i> (1968) [but included in <i>Pycnanthemum incanum</i> ]
Oklahoma	Choctaw, Le Flore, McCurtain, Ottawa, Pushtamaha	W-1; W-3; herbarium specimens
South Carolina	<i>Pycnanthemum incanum</i> reported in 22 counties throughout, but <i>P. albescens</i> probably does not occur in the state	Radford <i>et al.</i> (1968) [but included in <i>Pycnanthemum incanum</i> ]
Texas	Anderson, Bowie, Brazos, Cherokee, Fannin, Gregg, Harris, Houston, Montgomery, Polk, Rusk, Sabine, San Jacinto, Smith	W-1; W-3; herbarium specimens

## APPENDIX 3.

### Natural Diversity Database Element Ranking System

Modified from: <http://www.natureserve.org/explorer/ranking.htm> [W-7]

#### Global Ranking (G)

##### G1

**Critically imperiled worldwide.** Less than 6 viable elements occurrences (populations for species) OR less than 1,000 individuals OR less than 809.4 hectares (ha) (2,000 acres [ac]) known on the planet.

##### G2

**Imperiled worldwide.** 6 to 20 element occurrences OR 809.4 to 4,047 ha (2,000 to 10,000 ac) known on the planet.

##### G3

**Vulnerable worldwide.** 21 to 100 element occurrences OR 3,000 to 10,000 individuals OR 4,047 to 20,235 ha (10,000 to 50,000 ac) known on the planet.

##### G4

**Apparently secure worldwide.** This rank is clearly more secure than **G3** but factors exist to cause some concern (i.e. there is some threat, or somewhat narrow habitat).

##### G5

**Secure globally.** Numerous populations exist and there is no danger overall to the security of the element.

##### GH

**All sites are historic.** The element has not been seen for at least 20 years, but suitable habitat still exists.

##### GX

**All sites are extirpated.** This element is extinct in the wild.

##### GXC

**Extinct in the wild.** Exists only in cultivation.

##### G1Q

**Classification uncertain.** The element is very rare, but there is a taxonomic question associated

with it.

### National Heritage Ranking (N)

The rank of an element (species) can be assigned at the national level. The **N-rank** uses the same suffixes (clarifiers) as the global ranking system above. Rarely the designation **NNR** is used indicating that the species has not been ranked nationally.

### Subspecies Level Ranking (T)

Subspecies receive a **T-rank** attached to the G-rank. With the subspecies, the G-rank reflects the condition of the entire species, whereas the T-rank reflects the global situation of just the subspecies or variety.

For example: *Chorizanthe robusta* var. *hartwegii*. This plant is ranked **G2T1**. The G-rank refers to the whole species range (*i.e.*, *Chorizanthe robusta*, whereas the T-rank refers only to the global condition of var. *hartwegii*. Otherwise, the variations in the clarifiers that can be used match those of the G-rank.

### State Ranking (S)

#### S1

**Critically imperiled.** Less than 6 element occurrences OR less than 1,000 individuals OR less than 809.4 ha (2,000 ac). **S1.1** = very threatened; **S1.2** = threatened; **S1.3** = no current threats known.

#### S2

**Imperiled.** 6 to 20 element occurrences OR 3,000 individuals OR 809.4 to 4,047 ha (2,000 to 10,000 ac). **S2.1** = very threatened; **S2.2** = threatened; **S2.3** = no current threats known.

#### S3

**Vulnerable.** 21 to 100 element occurrences OR 3,000 to 10,000 individuals OR 4,047 to 20,235 ha (10,000 to 50,000 ac). **S3.1** = very threatened; **S3.2** = threatened; **S3.3** = no current threats known.

#### S4

**Apparently Secure.** This rank is clearly lower than S3 but factors exist to cause some concern (*i.e.*, there is some threat, or somewhat narrow habitat).

#### S5

**Secure.** Demonstrably secure to ineradicable in the state.

**SH**

All state sites are historic; the element has not been seen for at least 20 years, but suitable habitat still exists. Possibly extirpated.

**SNR, SU**

Reported to occur in the state. Otherwise not ranked.

**SX**

All state sites are extirpated; this element is extinct in the wild. Presumed extirpated.

**Notes:**

1. Other considerations used when ranking a species or natural community include the pattern of distribution of the element on the landscape, fragmentation of the population/stands, and historical extent as compared to its modern range. It is important to take a bird's eye or aerial view when ranking sensitive elements rather than simply counting element occurrences.
2. Uncertainty about the rank of an element is expressed in two major ways: by expressing the rank as a range of values (*e.g.*, **S2S3** means the rank is somewhere between S2 and S3), and by adding a '?' to the rank (*e.g.* S2?). This represents more certainty than S2S3, but less than S2.